

Detector Consortia: what, why, when and how?

Mark Thomson

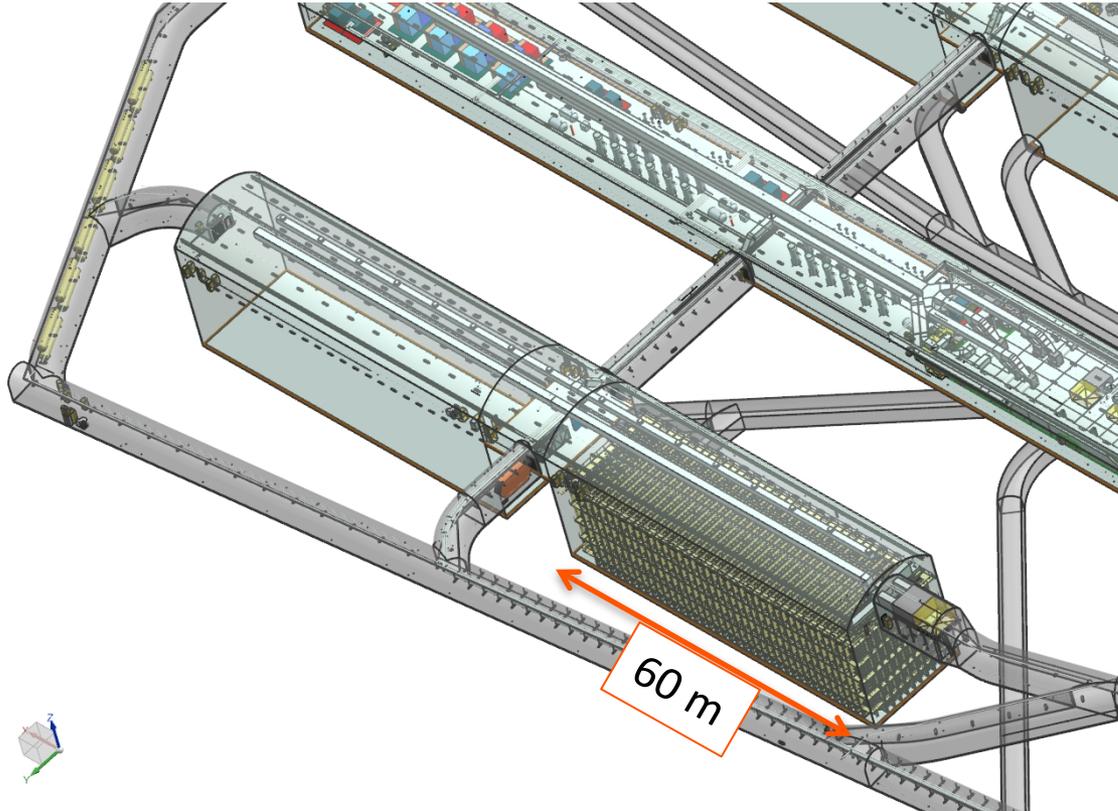
Dual-Phase Meeting, CERN, 26th June 2017

1. Introduction: Overall Timeline

- **Expected timeline for DUNE (and LBNF) reviews**
 - Mid-2018: **Technical Proposal for FD** (+costs, responsibilities)
 - End-2018: **Decision on** (at least) **first two FD modules**
 - Jan/Feb 2019: **RRB** for to provide funding status
 - July 2019: **LBNC** review of TDRs
Review of **international** DUNE construction project
 - Sept 2019: **RRB** to confirm **funding** status for construction
validation of **international** funding model
 - October 2019: DOE **CD-2** Review of LBNF (Far) and DUNE-US:
far site and two far detector modules
 - August 2020: DOE **CD-2** for near facilities and DUNE-US ND
- **In just over two years**
 - Need **FD technical designs** and understanding of **funding model**

2. Far Detector Strategy

- **Four chambers hosting four independent 10-kt FD modules**
 - Flexibility for **staging & evolution** of LAr-TPC technology design
 - Assume **four cryostats**: 15.1 (W) x 14.0 (H) x 62 (L) m³
 - Assume the four 10-kt modules will be similar but **not identical**



Far Detector Staging

- **Four chambers hosting four independent 10-kt FD modules**
 - Flexibility for **staging & evolution** of LAr-TPC technology design
 - Assume **four cryostats**: 15.1 (W) x 14.0 (H) x 62 (L) m³
 - Assume the four 10-kt modules will be similar but **not identical**
- **Two LAr readout technologies on the table**
 - **Single-Phase** (Ionization read out in the **Liquid Ar**)
 - Demonstrated by ICARUS & MicroBooNE
 - **Dual-Phase** (Ionization amplified and read out in Gas Ar)
 - Being demonstrated by WA105 (!) and then protoDUNE-DP
- **Working towards a concrete plan for (at least) first two far detector modules**
 - with a funding model agreed by the FAs
 - Staging will be an important decision for the collaboration

Planning Strategy and Decisions

★ Need Resource matrix for (at least) first two FD modules by 2019

★ Planning Strategy is to keep options open:

- Could be two modules of same type
- Could be 1 + 1 (plan for first SP, second DP)
- Identify full scope (4 FD modules) as early as possible

★ Decision on (at least) first two FD modules at end 2018

★ Decision process will be defined in 2017, non-trivial parameter space:

- Detector performance, Cost, Risk, Opportunity
- **Resources** and interest from collaboration

Updated FD Planning Strategy

- Agreed in EC earlier this year
- Assumes success of both protoDUNE detectors
 - Success is defined in dune-doc-2765
- At this stage wish to keep options open
- For planning purposes:
 - “we are assuming that the first far detector module will be single-phase and the second will be dual-phase”
 - “This planning strategy is not intended to prejudice the actual technology decision in late 2018/early 2019, which will be based on the full knowledge at that time and the availability of funding.”
 - i.e. plan so that all options can be on the table

2.1 Far Detector Consortia

- **Motivation:**

- By 2019, need to understand contributions to **at least** the first two FD modules & funding
- **To succeed, need to press forward with this process**

- **Model:**

- Build collaboration detector activities around “**consortia of institutions**” responsible for detector sub-systems
- August 2017: will replace existing FD WG organization with sub-detector consortia
 - **Evolution towards LHC GPD organization structure**
- Use the consortia to facilitate the process whereby **institutions take on responsibility** for concrete tasks
 - **Funding Agency engagement is essential**

Far Detector Consortia

- **Process**

- Developed over course of last 18 months:
 - Collaboration: EC & collaboration meetings
 - Funding agencies: RRB & DOE
 - Reviews: LBNC & DOE IPR

- **Consortia operate within the DUNE collaboration**

- Each consortium is self-organizing, working within collaboration rules:
 - Elected Consortium Leader (faculty scientist or equivalent)
 - Select a Technical Lead – acts as project manager
 - Consortium Board with a representative from each institution
 - Internal Project Management Board (PMB) with representatives from each contributing national project
 - ...

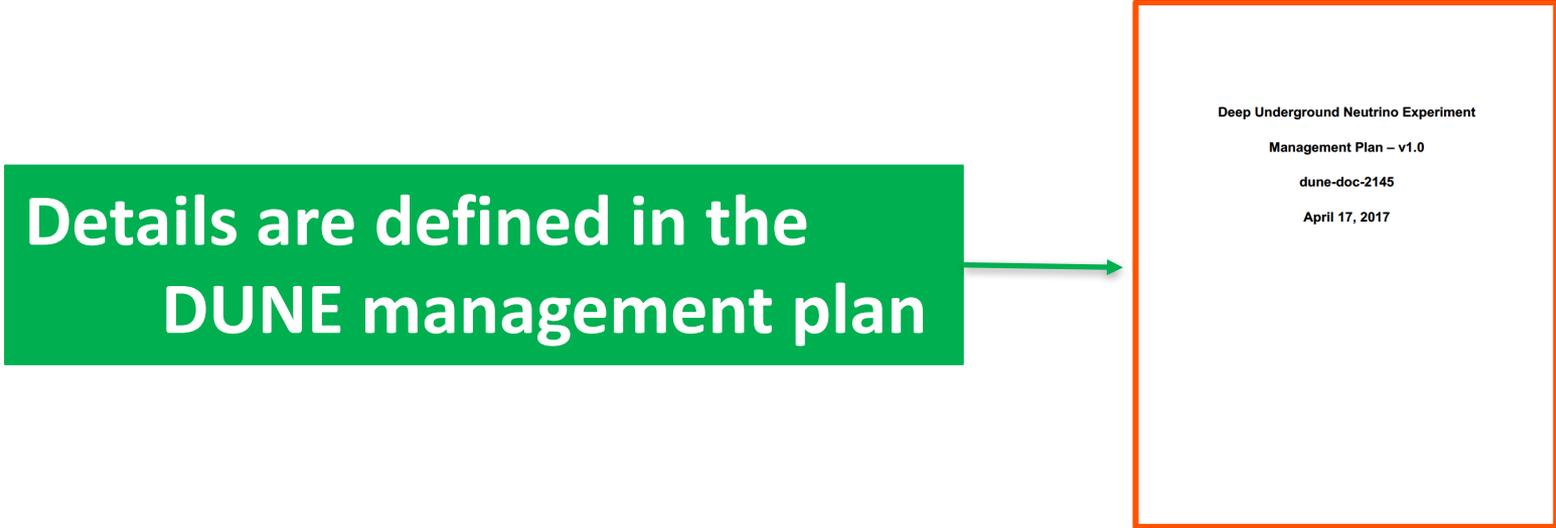
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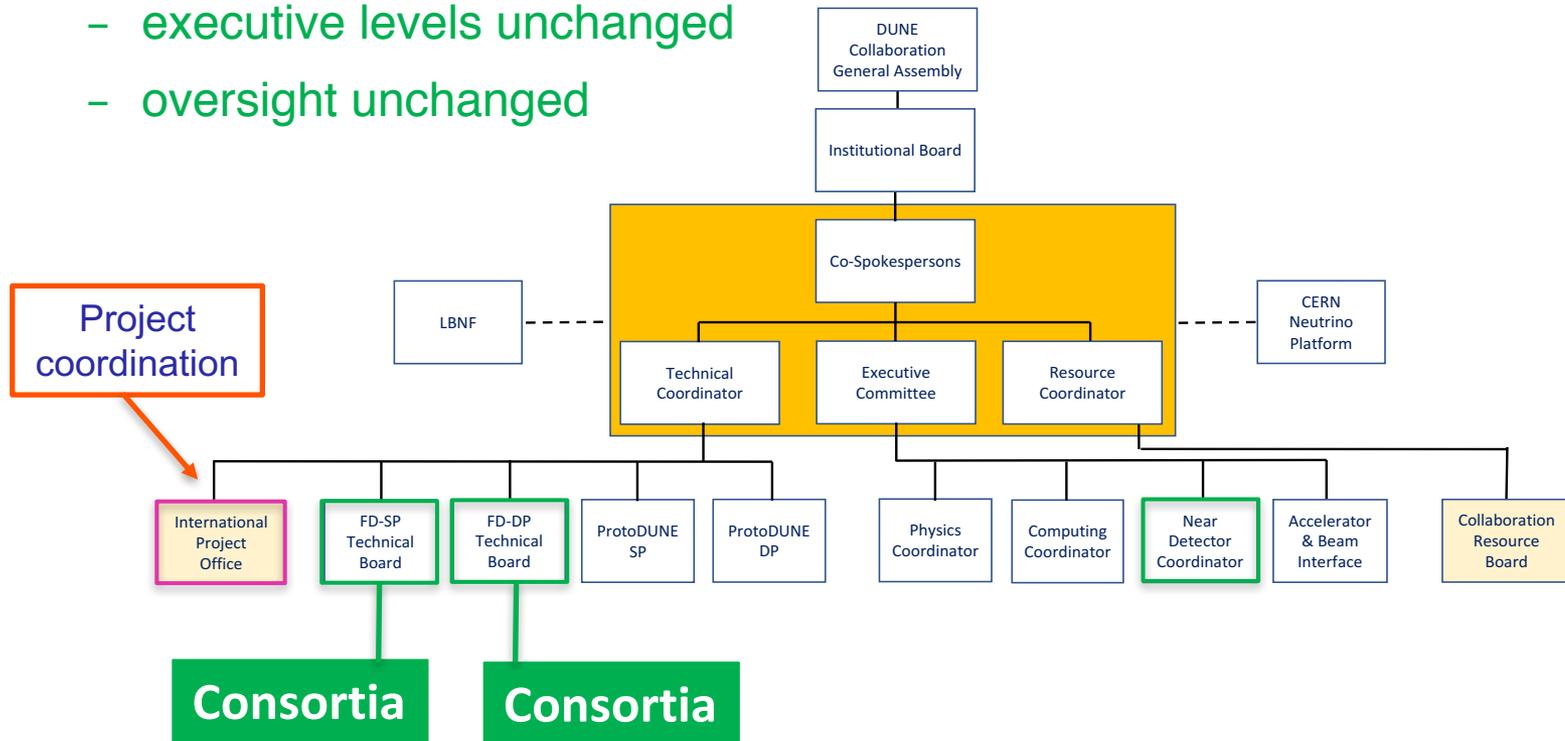
**Details are defined in the
DUNE management plan**



Deep Underground Neutrino Experiment
Management Plan – v1.0
dune-doc-2145
April 17, 2017

2.2 Management Structure ~2017

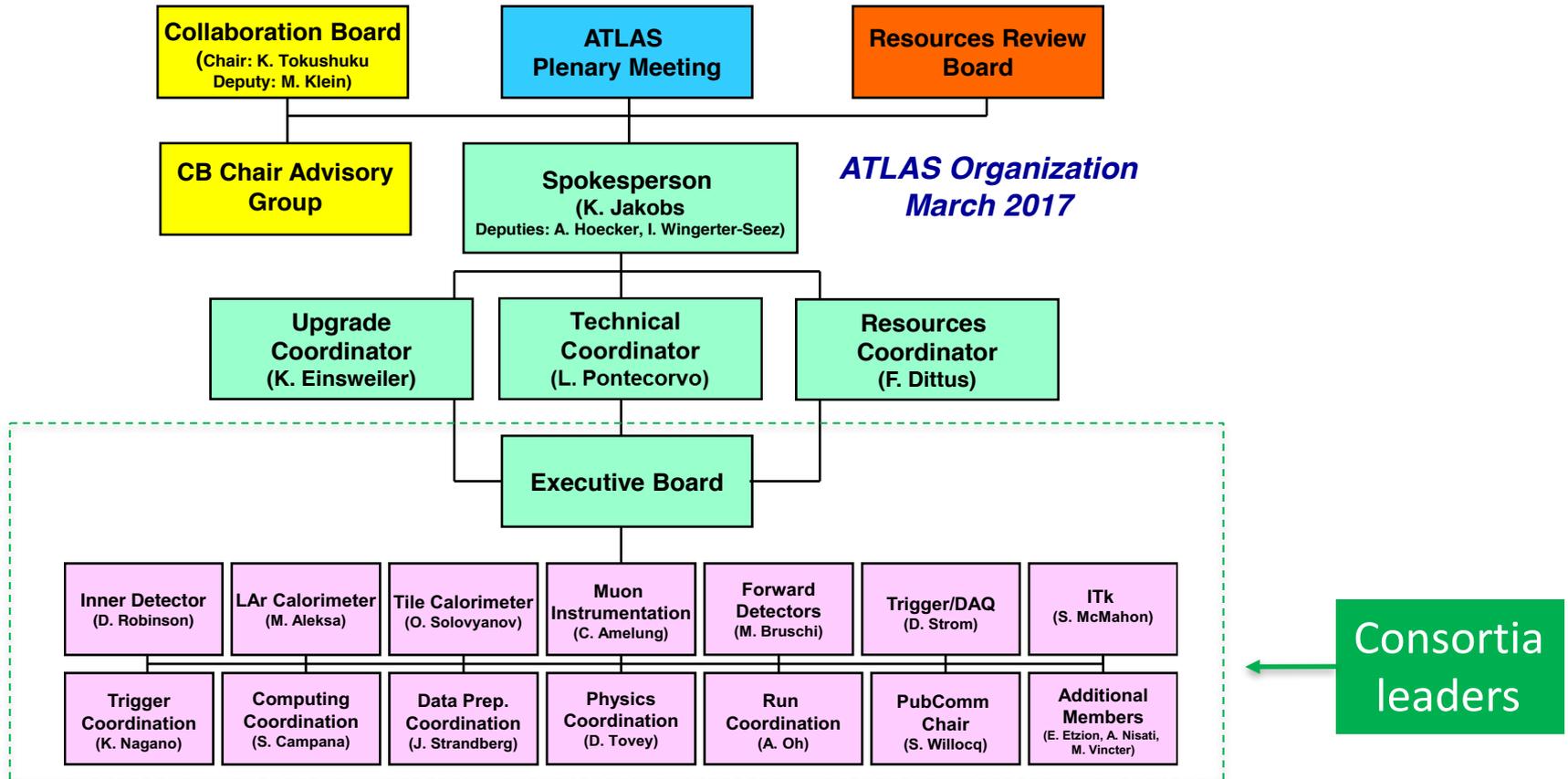
- **Modified DUNE organizational structure to implement our strategy for CD-2: FD WGs → Construction Consortia**
 - in addition, removed a layer of management to clarify reporting lines
 - executive levels unchanged
 - oversight unchanged



2.3 Future DUNE Organization

- **Plan to restructure DUNE EC for construction phase**
 - Agreed by DUNE EC earlier this year
 - Planned for “post-TDR”, eg. sometime in 2019/2020
 - EC becomes central management body
 - Co-Spokes, TC, RC, International Project Coordinator
 - Consortium leaders
 - Physics coordinator, Computing coordinator
 - Possibly with “at large” elected members
- **Collaboration managed by team leading construction**
- **LBNC advice: form the new EC earlier rather than later**
 - See some advantages in this, but timeline yet to be discussed
 - Changes also need to go through IB

e.g. the ATLAS model



- **EC becomes a true executive body**

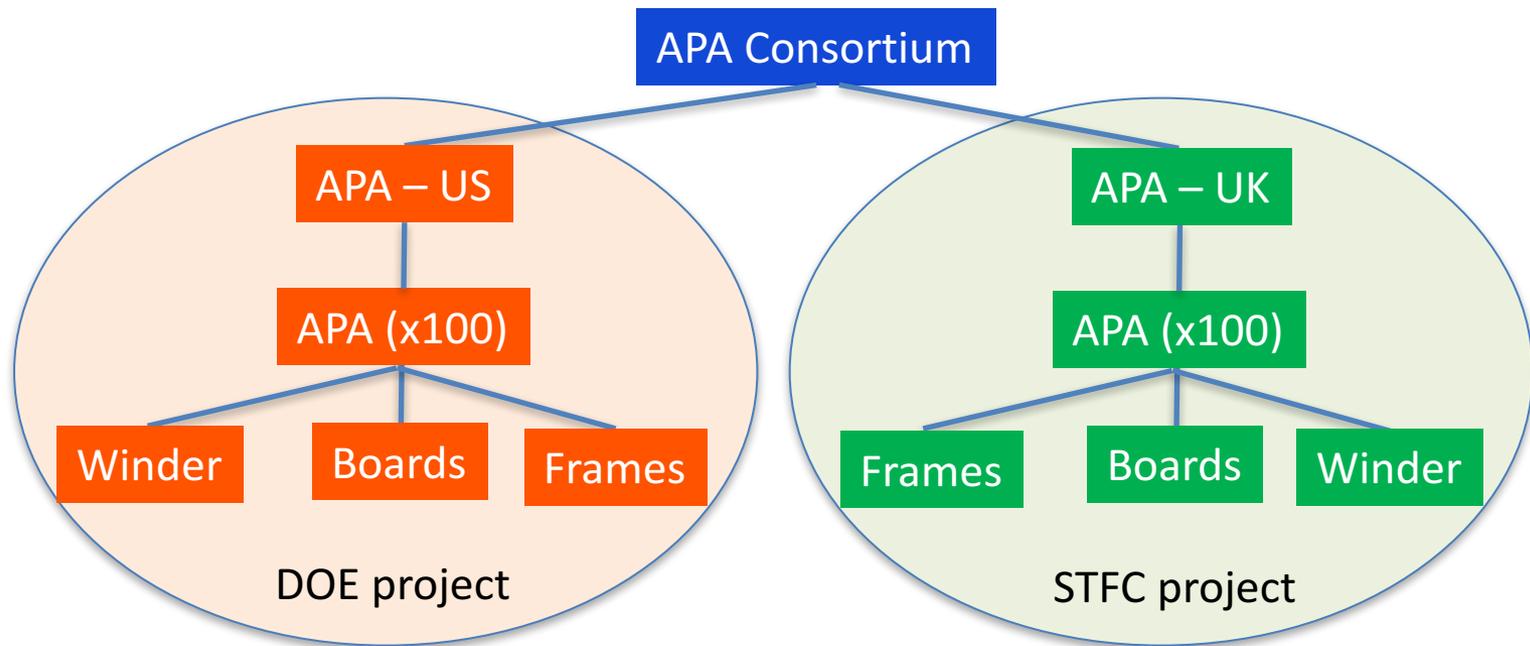
- Would broaden collaboration participation in decision making

3. Added value of Consortia?

- **Detectors / detector systems will be international**
 - Different countries/institutions take on elements of scope
 - Top-down project management model is unlikely to work
 - Resources are distributed across multiple funding agencies
 - Responsibilities and management needs to follow resources
 - Consortium model follows the approach that was successful at the LHC
 - The funding agencies understand this model !
- **Organization follows responsibilities**
 - Consortium model gives direct responsibility to institutions doing the work
 - Funding agencies are familiar with this model from the LHC
 - Strong endorsement of this approach from the LBNC and RRB
 - Helps that funding agencies understand how we will manage the construction

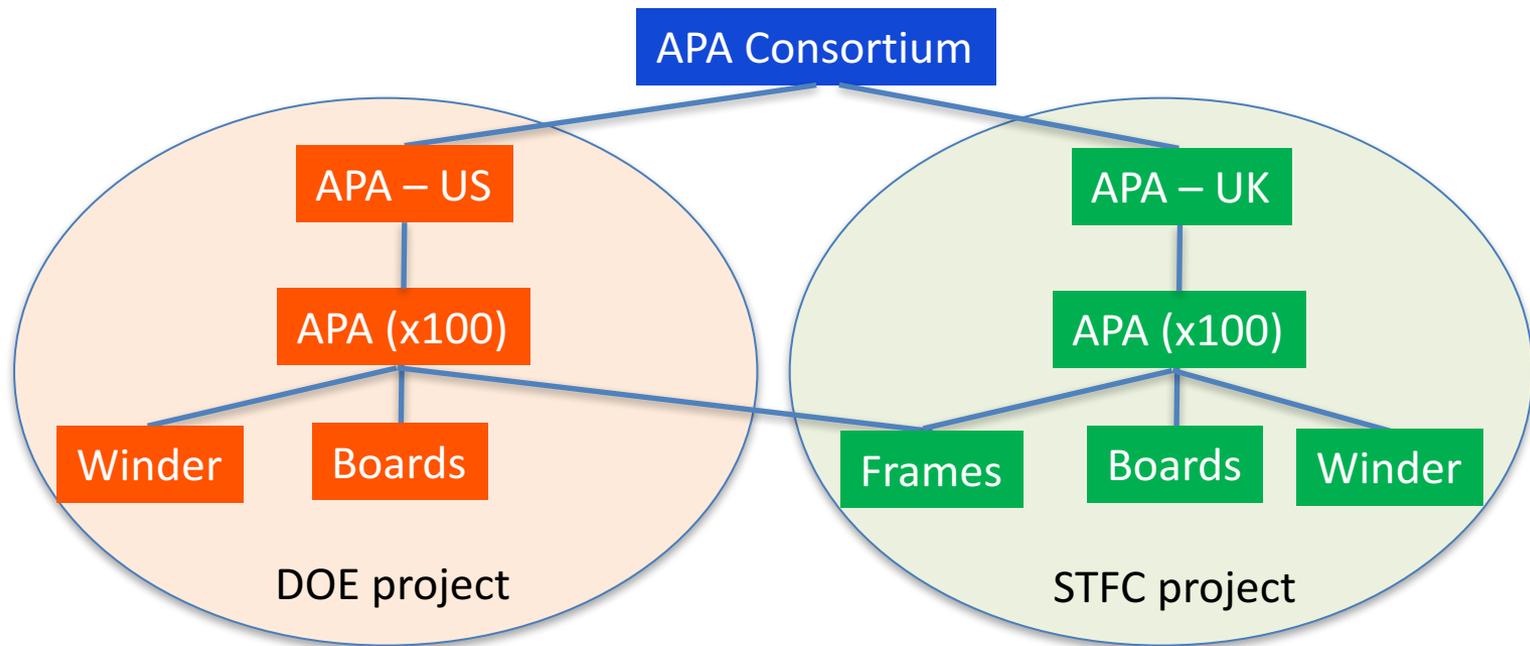
International vs National

- **International Project Office holds overall WBS**
 - Single APA consortium, but multiple national-level projects



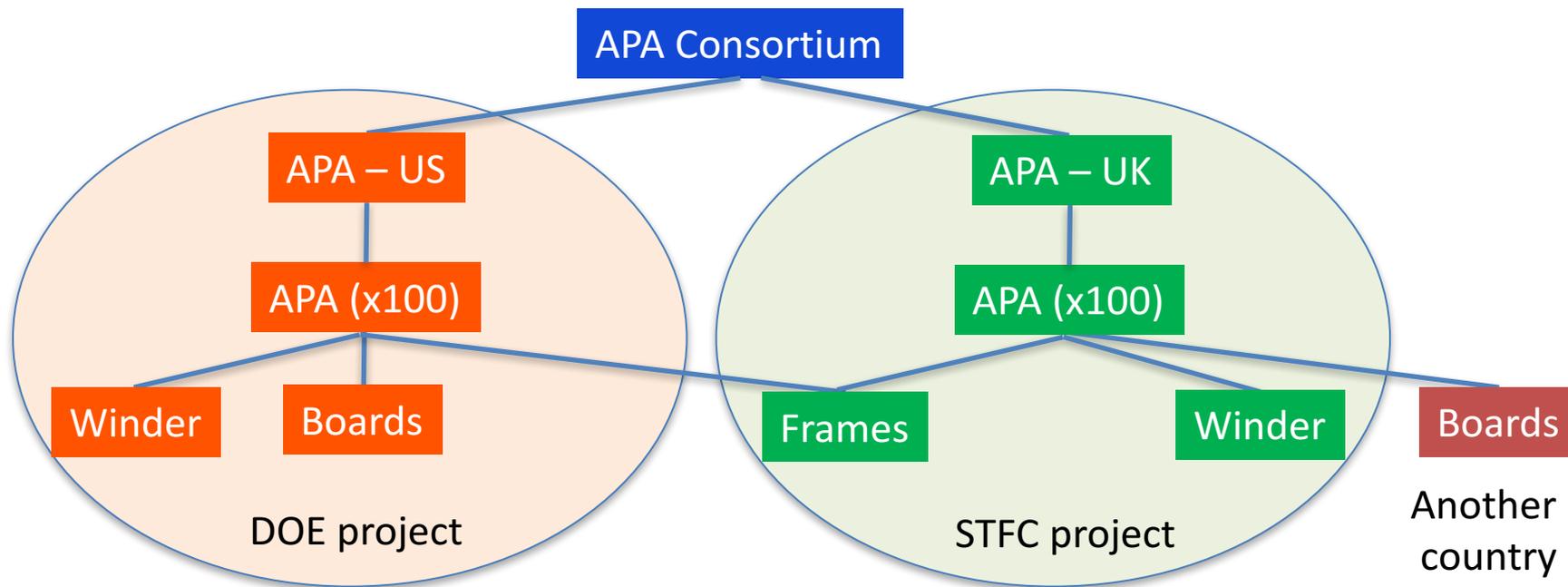
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- **Project management is distributed**
 - each **national-level** project responsible for its assigned deliverables

International Project Management

- **DUNE operates as an international collaboration**
 - International Project Office **coordinates** international efforts for both SP and DP
- **Project Management**
 - Each participating nation manages its own construction project(s). e.g. there will be:
 - a US DOE project run under DOE rules
 - a Swiss project, managed according to Swiss standards, etc.
 - **International Project Office** responsible for:
 - Maintaining overall schedule through detailed milestones
 - Tracking collaboration progress against milestones
 - Installation planning and management
 - Safety...

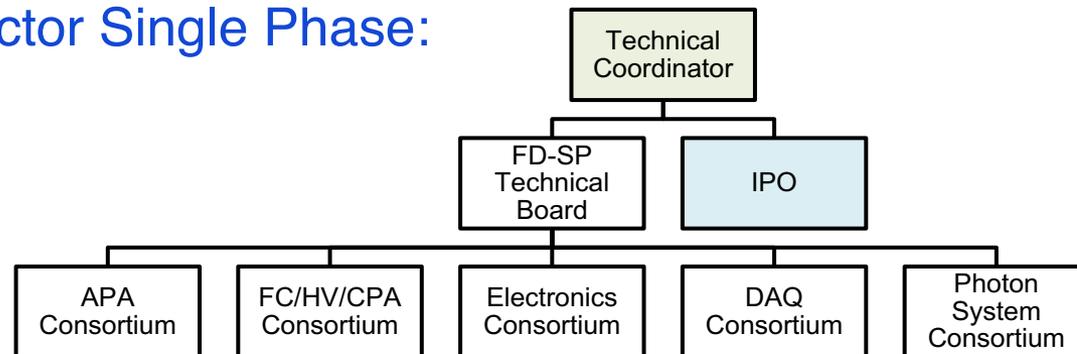
4. What are consortia?

- **Consortia within the DUNE collaboration**

- Each consortium is self-organizing, working within collaboration rules
- General concept agreed by EC over one year ago – described in dune-doc-1050 (strategy document)
- Details of how the consortia operate within the collaboration described in the dune-doc-2145 (management plan)

- **Consortia come together under a technical board**

- e.g. Far Detector Single Phase:



- IPO provides overall project coordination

Consortium Organization

- **Consortium Board (CB)**

- One representative from **each institution** in the consortium
 - “the consortium IB”

- **Consortium Leader**

- Overall responsibility for consortium deliverables
- Represents consortium within collaboration management
- University Faculty or laboratory equivalent
- Elected by consortium board (CB)
- **These are an important role – requires a significant level of commitment**

- **Technical Lead**

- Acts as overall project manager for consortium
- Reports to consortium leader

5. Why now?

- **Definition of construction responsibilities and “funding matrix” is on the critical path**
 - Will be an iterative process, **but has to start now**
 - There is a lot of work ahead if we are to keep to 2019 TDR schedule
- **Working backwards**
 - **Q3 2019:** agreements on responsibilities and funding (FA sign-off)
 - **Q2 2019:** **TDR** reviewed by LBNC
 - **Q1 2019:** Presentation of funding-matrix to RRB (FA reps) – sanity check
 - **Q4 2018:** Decision on design of first two FD modules
 - **Q2 2018:** **Technical Proposal:** costs & planned division of responsibilities
 - **Q4 2017:** Presentation of aspirations for consortia responsibilities to RRB
 - **Q3 2017:** First face-to-face meeting at August collaboration meeting

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Getting Started

- **Timeline**

- Aim to have consortia functioning by August collaboration meeting
 - **Several short-term deliverables: status for RRB, Technical Proposal**
- **Want to have consortium leaders in place as soon as possible**
- Election ASAP. Necessarily, some element of boot-strapping...

- **Plan**

- Elect consortium leader, initially for 1-year
 - **goal to deliver Technical Proposal**
- After Technical Proposal, roles and consortium membership will be better defined: at this time there will be a new election for leader
 - **Expectation is that the initial CL may continue**
 - **Term is to the delivery of TDR**

Bootstrapping: SP case

• Consortium Membership

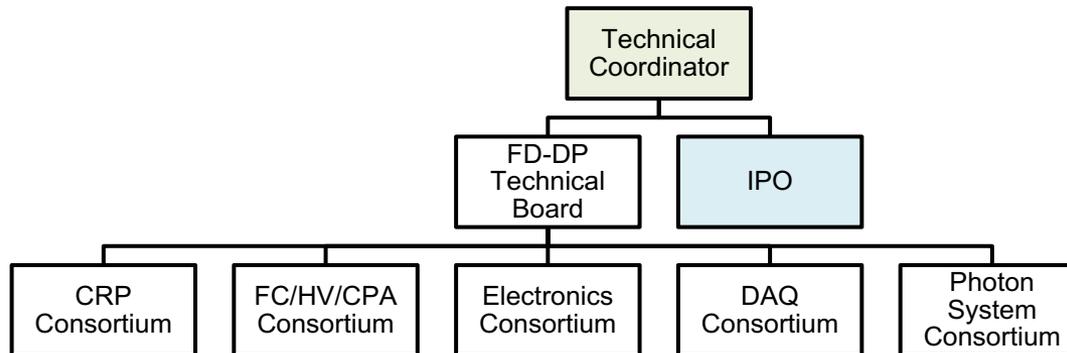
- Define consortium membership by end of June
 - Process organized by Technical Coordinator ✓
 - Phone meeting to identify list of deliverables (hardware + scientific support) ✓
 - Eric will discuss the details
 - IB representatives then contact TC to formally join initial consortium, including a description of possible role and potential funding source(s) ~week
 - Will also be possible to join at a later date

• Consortium Leader

- Election of Consortium Leader in early July
 - Process will be steered by DUNE Co-spokespersons
 - Consortium Board members nominate candidates for CL to Co-spokes
 - Co-spokes will talk to potential candidates
 - CL is an important position and will be a major commitment
 - EC recommends a slate of candidates for election
 - CB representatives vote (1 vote per institution)

6. What does this mean for DP?

- **First need to agree on consortia**
 - Aiming for a symmetric approach
 - A possible model ???



6.1 Common activities

- **Envision some common SP/DP consortia**
 - Needs to make sense in terms of deliverables, e.g. common WBS
 - Needs to be an effective management model
 - What *could* be in common?
 - Slow Controls/Detector Instrumentation Consortium - **yes**
 - Computing “Consortium” - **yes**
 - HV/FC/Cathode: clear overlaps in HV & FC - **probably**
 - DAQ: common backend + consider front end - **probably**
 - APA/CRP: no overlap - **no**
 - Electronics: two different systems - **no**
 - Photon Detection System: two different solutions, little commonality - **no**

6.2 Next Steps

- **Issue call for consortium membership ASAP**
- **Ideally a common call for SP & DP**
 - Circumvents an EoI process for DP; probably not a major issue (???)
 - Initially set up the five SP and five(?) DP consortia as separate entities. Several advantages:
 - Expediency
 - Understand interests and possible funding models
 - Define required deliverables
 - Investigate common SP/DP DAQ & HV consortia as early as reasonable and at latest, within 6 months.
 - Immediately, also would call for common “Slow Cont./Det. Instrum. consortium” and probably “Computing”
 - Encourage institutions to consider **both** SP & DP

7. Discussion

- **Possible topics**

- Is there consensus on DP consortia?
- How to move forward
 - scope/deliverables of consortia [leave until after Eric's talk]
 - call for initial consortium membership in parallel with SP?
- **Common consortia**
 - DAQ and HV/FC/Cathode?
 - timeline
 - leadership
- **Improved integration of SP & DP into DUNE**
 - How to move to a more integrated collaboration?

- **What have I missed?**